

THE GENUS *PSYCHONOTIS* TOXOPEUS IN THE SOLOMON ISLANDS, WITH DESCRIPTIONS OF FIVE NEW TAXA (LEPIDOPTERA: LYCAENIDAE)

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Abstract

Examination of *Psychonotis* Toxopeus material from Papua New Guinea and the Solomon Islands shows that two distinct taxa have previously been included under *Psychonotis kruera* (Druce). A lectotype for *P. kruera*, from Florida Island, is designated. Five new taxa are described: *P. julie* sp. nov. (San Cristobal); *P. eleanor* sp. nov. (New Georgia Group); *P. aihuru* sp. nov. (San Cristobal); *P. slithyi* sp. nov. (Malaita) and *P. slithyi borogrovesi* ssp. nov. (Ulawa). Diversity of *Psychonotis* taxa in the Solomon Islands accords closely with the distribution of other butterfly groups and with the geological history of the islands.

Introduction

The Australasian genus *Psychonotis* Toxopeus, 1930, occurs from Sulawesi in the west to New Guinea, Australia, the Solomon Islands and New Caledonia in the east. In a review of the Oriental and Australian Polyommataini, Hirowatari (1992) recognised nine species of *Psychonotis*, three of which [*P. caelius* (C & R Felder, 1860); *P. brownii* (Druce & Bethune-Baker, 1893) and *P. hebes* (Druce, 1904)] occur in New Guinea and one, *P. kruera* (Druce, 1891), extends to the Solomon Islands. Parsons (1998) also included the Solomon Islands in the distribution of *P. caelius* but no specimens from there have been seen by the present author. Parsons (1998) also referred to a male of an undescribed *Psychonotis* species from New Ireland in The Natural History Museum, London (BMNH) and included a line drawing of the valve and a colour illustration of both surfaces of the adult.

Druce (1891) described *P. kruera* from a male from Florida Island and a female from Malaita. There are few specimens of *P. kruera* in museum collections and further material, collected in 1996 and 1997, shows that the species is widespread throughout the western Solomon Islands, but that two taxa had previously been included under the name *kruera* (see *P. slithyi* sp. nov., below). It also transpired that the specimens from which *P. kruera* was described, both now in the BMNH and both bearing 'Type' labels, represented different species.

Although known *Psychonotis* species usually present no difficulties in identification, some confusion is possible. Male genitalia are distinctive. In particular, the shape of the posterior section of the valvae differs significantly between species, especially when viewed dorsally and slightly obliquely. Hirowatari (1992) illustrated the male genitalia of several New Guinea taxa,

including *P. kruera* and Parsons (1998) provided a comparison between the valves of *P. brownii* and an undescribed *Psychonotis* species from New Ireland. Further undescribed *Psychonotis* species, collected on islands of the New Georgia Group and on San Cristobal, raise the total of known species in the genus to 14. Male genitalia of *Psychonotis* species known from the New Guinea region are figured below (figs 19-26). Colour illustrations of the new taxa will appear in a forthcoming book on the butterflies of the Solomon Islands.

Systematics

Psychonotis kruera (Druce, 1891)

(Fig. 20)

Material examined. *Lectotype* ♂ [here designated], SOLOMON ISLANDS: 'Florida I., Solomon Is., Woodford / Godman-Salvin Coll. 1908-168 / Type / *Thysonotis kruera*, Type, H H Druce' (BMNH). Non-type material: Numerous specimens, including the following genitalia preparations: 7 ♂♂, Choiseul (BMNH (V) 4975, 4976, 4977, 4978, 5104, 5105, 5106); 3 ♂♂, Santa Isabel (BMNH (V) 5107, 5108, 5109); 1 ♂, Guadalcanal (BMNH (V) 5110); 1 ♂, Florida (BMNH (V) 1119) (all BMNH). PAPUA NEW GUINEA: 1 ♂, Bougainville (JT 478) (Australian National Insect Collection, Canberra).

Description. Male forewing length 14 mm; upperside dark shining blue; outer margins and hindwing inner margin narrowly bordered dark brown; forewing underside plain white, costa and outer margin with broad dark brown margins, unmarked; hindwing underside white, outer margin with broad dark brown band enclosing submarginal series of small, iridescent blue/green markings, often with reduced or vestigial series distad, especially near tornus. Genitalia (fig. 20) typical of polyommata lycaenids, but unique in that upper section of diaphragma supports sclerotised band, weakly connected to juxta and lateral processes of tegumen, thereby forming a ring surrounding, but separate from, aedeagus (Eliot 1973). Male valve with posterior 'lobe' rounded, not serrate. Female forewing upperside with pale, shining silvery blue restricted to basal area and inner margin, the costa and outer margins broadly dark brown; hindwing upperside pale silvery blue with broad dark brown outer margin; underside similar to male.

Distribution. Western Solomon Islands and Bougainville, Woodlark and Misima islands, Papua New Guinea.

Comments. The female specimen recorded by Druce (1891) becomes a paratype of *P. slithyi* sp. nov. Both *P. kruera* and *P. slithyi* are subject to individual variation and intermediate specimens may be difficult or impossible to separate using exophenotypic characters alone, although male genitalia of each species are distinctive (cf. figs 19 & 20). The abdomen of the lectotype is missing. However, the markings are clearly those of western populations (i.e. not intermediate) and the genitalia of another male from Florida island in the BMNH are identical with those from western

populations. Selection of the Florida specimen as lectotype also results in the least nomenclatural disruption, since the species is widespread throughout the western Solomon Islands and parts of New Guinea, whilst the species represented by Druce's female (*P. slithyi*) is apparently restricted to Malaita and Ulawa. So far as is known, these two closely related taxa are allopatric in distribution.

***Psychonotis slithyi* sp. nov.**

(Figs 1, 4, 10, 13, 19)

Material examined. *Holotype* ♂, SOLOMON ISLANDS: Malaita, Auki to Fiu river, SL-200 m, 22.x.1997, W. J. Tennent (gen. prep. BMNH (V) 5111) (BMNH). *Paratypes*: 5 ♂♂, 2 ♀♀, same data as holotype (inc. gen. prep. BMNH (V) 5112); 4 ♂, same data as holotype, 11.iv.1997 (inc. gen. preps. BMNH (V) 5113, 5114, 5115); 1 ♂, Malaita, north-east of Auki, SL-200 m, 9.iv.1997, W. J. Tennent (gen. prep. BMNH (V) 5116); 2 ♀♀, Malaita, north, above Malu'u, SL-580 m, 24.x.1997, W. J. Tennent; 1 ♀ [*paralectotype* of *P. kruera*], 'N. W. Bay, Malaita I., Solomon Is., Woodford / Godman-Salvin Coll. 1908-168 / Type / *T. kruera* f, Type, H H Druce' (all BMNH); 1 ♂, 1 ♀, Malaita, Dala, 50 m, 7-22.vi.1984, J. & M. Sedlacek (Bernice P. Bishop Museum, Honolulu).

Description. Resembles *P. kruera*; male forewing length 14 mm; upperside indistinguishable from *P. kruera*; underside marginal dark bands slightly narrower than in *P. kruera*; hindwing underside with single series of iridescent blue markings in marginal band (often with at least the suggestion of double series in area of tornus in *P. kruera*). Genitalia (fig. 19) distinctive; valve with posterior lobe deeply serrated, slightly splayed (rounded, without terminal teeth in *P. kruera*). Female similar to *P. kruera*; upperside blue slightly darker.

Distribution. Malaita.

***Psychonotis slithyi borogrovesi* ssp. nov.**

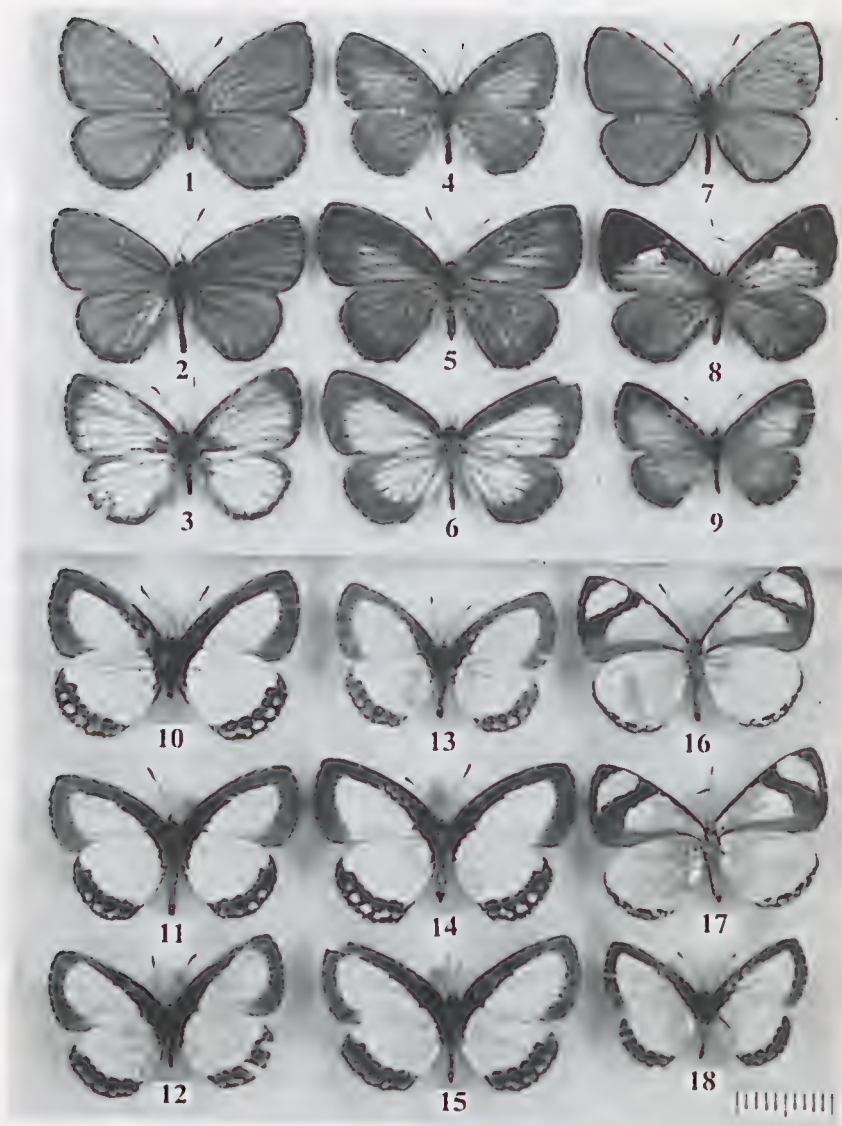
(Figs 2, 5, 11, 14)

Material examined. *Holotype* ♂, SOLOMON ISLANDS: Ulawa, north, Harrina village area, 40 m, 25.iii.1997, W. J. Tennent (BMNH). *Paratypes*: 9 ♂♂, 4 ♀♀, same data as holotype (inc. gen. preps. BMNH (V) 5117, 5118); 1 ♀, Ulawa, north, Kellmei and Harrina village areas, SL-40 m, 24.iii.1997 (all BMNH).

Description. Male forewing length 13 mm; indistinguishable from *P. s. lithyi*; genitalia similar to *P. s. slithyi*. Female distinctive; upperside blue dull, restricted to basal areas, leaving broad marginal border; underside marginal borders slightly broader than *P. s. slithyi*.

Distribution. Ulawa.

Comment. The island of Ulawa has a surprisingly high level of endemic butterfly taxa, considering its geographical proximity to Malaita (Tennent 1998).



Figs 1-18. *Psychonotis* species, upper and undersides. (1, 10) *P. s. slithyi* ♂ (holotype); (4, 13) ditto ♀ (paratype); (2, 11) *P. slithyi borogrovesi* ♂ (holotype); (5, 14) ditto ♀ (paratype); (3, 12) *P. eleanor* ♂ (holotype); (6, 15) ditto ♀ (paratype); (7, 16) *P. julie* ♂ (holotype); (8, 17) ditto ♀ (paratype); (9, 18) *P. waihuru* ♀ (holotype). Scale bar = 1 cm.

Psychonotis julie sp. nov.

(Figs 7, 8, 16, 17, 21)

Material examined. Holotype ♂, SOLOMON ISLANDS: San Cristobal, above Hauta, 500-700 m, 3.iv.1997, W. J. Tennent (BMNH). Paratypes: 4 ♂♂, 3 ♀♀, same data (inc. gen. prep. BMNH (V) 5119); 1 ♂, 1 ♀, same data, 1.iv.1997 (male gen. prep. BMNH (V) 5120) (all BMNH).

Description. Male forewing length 14 mm; upperside dark shining blue, with narrow black margins; underside with restricted blue-green basal suffusion; forewing underside white; apex black; inner margin broadly black; broad black postmedian transverse stripe from costa to outer margin; hindwing underside white; ternal markings consisting of marginal elongated and barely confluent black spots, extending in thin line along outer margin; iridescent blue-green markings indistinct, confined to ternal spots. Genitalia typical of *Psychonotis*; valve irregular in shape, terminating in unserrated narrow pointed lobe (fig. 21). Female upperside similar to a species of *Erysichton* Fruhstorfer, forewing upperside with apex, outer margin and tornus broadly black; prominent white discal patch; posterior section of wing bright silver-blue; hindwing upperside dusted blue, particularly near inner margin; outer margin with wide dark band; underside similar to male.

Distribution. San Cristobal.

Comment. *P. julie* is unlike any other known *Psychonotis* species.

Psychonotis eleanor sp. nov.

(Figs 3, 6, 12, 15, 22)

Material examined. Holotype ♂, SOLOMON ISLANDS: New Georgia group, Kolombangara, inland from Vanga Point, SL-400 m, 25.viii.1996, W. J. Tennent (gen. prep. BMNH (V) 5121) (BMNH). Paratypes: 1 ♀, same data; 2 ♂♂, 2 ♀♀, Kolombangara, Vanga Point, SL-40 m, 23.viii.1996, W. J. Tennent (inc. gen. prep. BMNH (V) 5122); 1 ♀, same data, 26.viii.1996; 1 ♀, same data, 27.viii.1996; 1 ♀, New Georgia, north coast, Menakasapa (Paradise), SL-20 m, 1.ix.1996, W.J. Tennent; 1 ♀, New Georgia Group, Vella Lavella, southeast corner, SL-40 m, I.J. Woods, 6.viii.1997 (all BMNH).

Description. Male forewing length 13 mm; upperside bright shining blue (dark blue in other members of the *kruera* species-group); margins brown, broader at fw apex (uniformly narrow in *P. kruera*); underside similar to *P. kruera*; hindwing underside with iridescent ternal markings in single line, prominent. Genitalia (fig. 22) superficially similar to *P. kruera* (cf. fig. 20), larger, posterior of valve with less rounded (i.e. more 'open') shape. Female upperside pale shining blue (darker in *P. kruera* and *P. slithyi*); borders brown, broad; forewing upperside with cubital vein and section of veins 2, 3 and 4 nearest cubital vein distinctly white; underside similar to male.

Distribution. New Georgia, Kolombangara, Vella Lavella and probably other islands of the New Georgia Group.

Comment. *P. kruera* has not been recorded from the New Georgia Group and is apparently replaced there by *P. eleanor*.

Psychonotis waihuru sp. nov.

(Figs 9, 18)

Material examined. Holotype ♀, SOLOMON ISLANDS: San Cristobal, above Hauta, 500-700 m, 3.iv.1997, W. J. Tennent (BMNH).

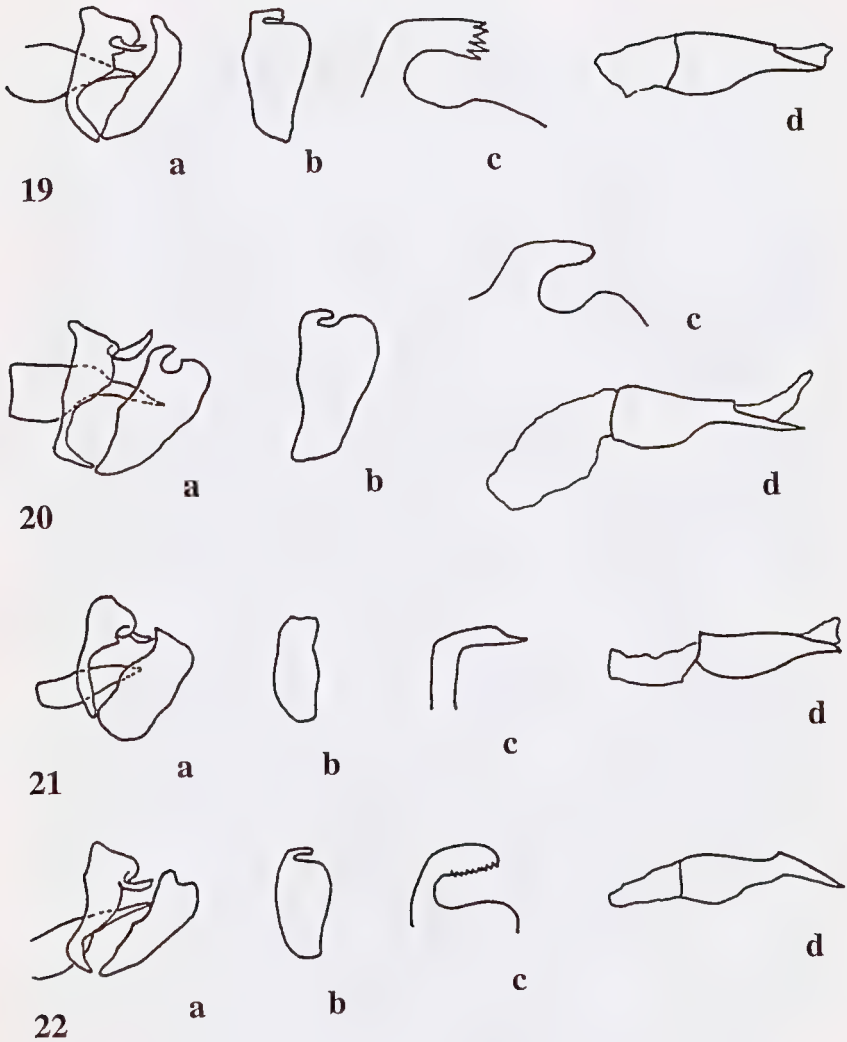
Description. Female forewing length 12 mm; similar to *P. slithyi*; upperside blue more dull; underside similar to other *kruera* species-group; forewing underside with marginal dark border narrow in comparison with *P. kruera* and *P. slithyi*, ending cleanly at tornus (becoming diffuse, slightly broader and extending slightly along the inner margin in *P. kruera* and *P. slithyi*); hindwing underside with iridescent markings small, inconspicuous. Male unknown.

Distribution. San Cristobal.

Comments. This taxon represents the first record of the *kruera* species-group from the island of San Cristobal and is named after John Waihuru, village chief at Hauta, whose interest in nature and embrace of ecotourism is a good example of a realistic alternative to the ubiquitous and destructive logging practices which pervade the western Pacific islands. San Cristobal is one of the most interesting of the large mountainous and forested Solomon islands, and supports a high percentage of endemic butterfly taxa (Tennent 1998).

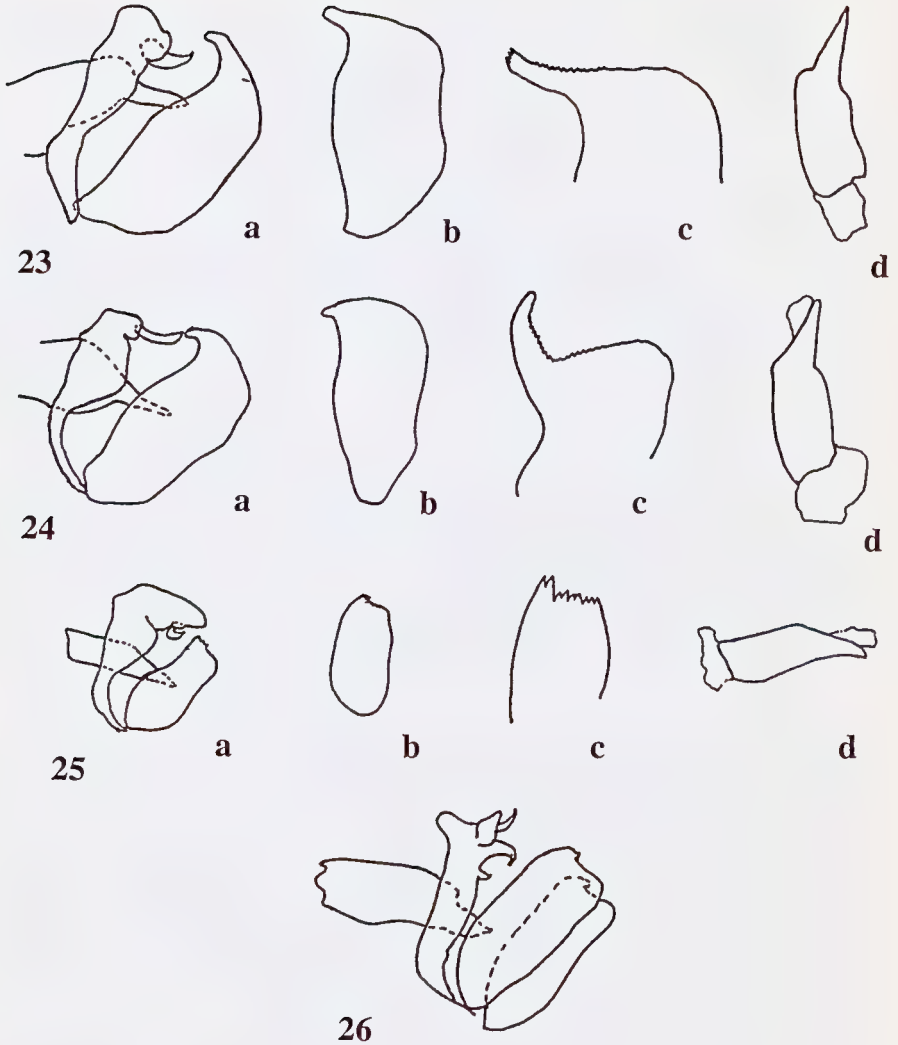
Discussion

Some minor variation in phenotype was observed in *P. kruera* from different islands although it was not possible, with the material available, to properly assess whether even further taxa are involved. On the face of it, this seems unlikely. In comparison with some of the other Solomon islands, which support a high or moderately high proportion of endemic taxa (e.g. New Georgia Group, Malaita, San Cristobal etc.), the islands of Choiseul, Santa Isabel and the Florida group have few endemic taxa (Tennent 1998). It is probable that this is a result of their role as 'stepping stones' in the spread of fauna from west (i.e. Bougainville) to east and it has even been suggested (e.g. Diamond 1983) that these islands may have formed a land-bridge as recently as 2 mya. Guadalcanal may also have been part of this 'bridge' and a bathymetric high linking these islands suggests they would certainly have been closer together during recent periods of sea level fluctuation, although much of Guadalcanal has been submerged in recent times, probably during the last 100,000 years (P. Coleman, pers. comm.). Malaita, Ulawa and San Cristobal are geologically recent (M. Petterson, pers. comm.) and support a relatively high level of endemic taxa (Tennent 1998). The known distribution of *Psychonotis* taxa in the Solomon Islands, with one taxon occurring on Choiseul, Santa Isabel, Florida, Guadalcanal and Savo



Figs 19-22. *Psychonotis* male genitalia: a, genitalia (lateral view); b, right valve (lateral view); c, posterior of valve (dorso-lateral view); d, aedeagus. (19) *P. slithyi* (Malaita); (20) *P. kruera* (Choiseul); (21) *P. julie* (San Cristobal); (22) *P. eleanor* (Kolombangara).

P. kruera) and distinct species on the New Georgia Group (*P. eleanor*), Malaita and Ulawa (*P. slithyi*) and San Cristobal (*P. julie*, *P. waihuru*)



Figs 23-26. *Psychonotis* male genitalia: a, genitalia (lateral view); b, right valve (lateral view); c, posterior of valve (dorso-lateral view); d, aedeagus. (23) *P. caelius* (New Ireland); (24) *P. hebes* (New Guinea); (25) *P. brownii* (New Britain); (26) *Psychonotis* sp. (New Ireland), genitalia.

(*P. kruera*) and distinct species on the New Georgia Group (*P. eleanor*), Malaita and Ulawa (*P. slithyi*) and San Cristobal (*P. julie*, *P. waihuru*) closely parallels the distribution of other butterfly groups as well as the islands' geological history.

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